United Nations

Economic and Social Council

Distr.: General
19 July 2018

Original: English

Economic Commission for Africa
Statistical Commission for Africa
Sixth meeting

Addis Ababa
1 – 4 October 2018

Report on the strategy for integrating geoinformation and statistics in Africa

The preparedness of African countries for the incorporation of geoinformation and statistics, remote sensing and other geospatial solutions, tools and techniques into statistical processes

I. Need for geospatial information

1. The 2030 Agenda for Sustainable Development reflects the need for new data acquisition and integration approaches to improve the availability, quality, timeliness and disaggregation of data. Measuring and monitoring the progress in implementing the 2030 Agenda will require huge amounts of data, much of it new or repurposed, more rigorous modelling and analysis and improved data management. It will also require transformative change and collaborative approaches to link different data, such as demographic, statistical, earth observation, environmental and other societal geospatial data, together with the one thing that they have in common: geographic location. A global indicator framework will be required, and this framework should comprise both a statistical and geospatial component.

2. Leveraging the opportunities of integrating statistical and geospatial information to support the 2020 census round and the 2030 Agenda will require leadership, collaborative global leadership, appropriate frameworks and methods and close collaboration between national statistics and geospatial and earth observation communities to deliver seamless data to achieve national and global objectives and aspirations.

3. African nations may therefore develop policies and accelerate the development and adoption of legal, technical, geospatial and statistical standards; promote the openness and exchange of data and metadata; encourage the interoperability of data and information systems; and support the integration of statistical and geospatial information, including its management and exchange. In other words, the 2030 Agenda will be a catalyst in strengthening the development and/or expansion of national spatial data infrastructures strategies in order to support the achievement of the 17 Sustainable Development Goals and their 169 targets by means of the global statistical and geospatial framework.

4. In the context of the Strategy for the Harmonization of Statistics in Africa, strong efforts should be made to develop a global statistical and

geospatial framework that will outline how geospatial information can be implemented and integrated into the Sustainable Development Goal indicator framework.

II. Key principles of a global statistical and geospatial framework

5. The global statistical and geospatial framework must be guided by the following principles:

(a) Principle 1: Use of fundamental geospatial infrastructure and geocoding. The framework requires a common and consistent approach to establishing the location and a geocode for each unit in a data set, such as a person, household, business, building or parcel/unit of land;

(b) Principle 2: Geocoded unit record data in a data management environment. The framework should contain a recommendation that the geocode for each statistical unit record in a data set (i.e., a person, household, business, building or parcel/unit of land) occur in a data management environment. The storage of a high precision geocode enables any geographic context to be applied when preparing the data for release in the future (i.e., aggregating data into a variety of larger geographic units);

(c) Principle 3: Common geographies for the dissemination of statistics. To enable comparisons among data sets from various sources, the framework should contain a recommendation that a consistent set of geographies be used for the display, reporting and analysis of social, economic and environmental information. This will ensure that all statistical data are geospatially enabled on a consistent basis and that users can discover, gain access to, integrate, analyse and visualize statistical information seamlessly for geographies of interest;

(d) Principle 4: Interoperable data and metadata standards. Both the statistics and geospatial data communities operate their own general data models and have their own metadata capabilities. The statistics community uses the Generic Statistical Information Model, and the Statistical Data and Metadata Exchange and Data Documentation Initiative mechanisms. The geospatial community uses the General Feature Model and developed the ISO19115 metadata standard, in addition to a number of application-specific standards;

(e) Principle 5: Accessible and usable geospatially enabled statistics. This component is aimed at identifying policies, standards and guidelines that support the release, access, analysis and visualization of geospatially enabled information. This information will highlight the wide range of legislative and operational issues that organizations need to be aware of when releasing and analysing information about people and businesses. Privacy and confidentiality requirements associated with releasing and analysing such information are significant issues relating to this principle. Other issues of relevance include data quality, analysis, dissemination and visualization.

III. Dimensions of the integration

6. It will be necessary to take into account all dimensions relating to the possible interaction between the statistics domain and the geospatial information sphere and streamline an applicable generic integration model, irrespective of the type of prevailing technological environment. A successful integration of geospatial and statistical information requires looking at the scale, policy, institutional and modelling dimensions.

A. Scale

7. Scale refers to the scope of the geographic space in which the integration is to take place. The scale of geospatial and statistical information integration will begin at the national level, including a downstream flow driven by the needs at the subnational levels (e.g., state, region and districts). The upstream direction, through aggregation at the data level, and harmonization at the policy level will meet higher dimension needs (i.e., regional economic communities and Africa as a whole). At each key position on the scale axis (i.e., national, subnational, regional and subregional), the other three dimension elements, namely, policy, institutional and modelling, have to be present or developed.

B. Policy

8. Policy is needed at all levels on the scale axis to initiate and harmonize the strategies and related regulations in order to achieve full integration. It will be demand-driven at the national level and take into account the constraints at the regional economic community and continental levels. National geospatial information policy, on the one hand, and the data policy sustaining the national strategy for the development of statistics, on the other, will need to be critically reviewed and made compatible.

C. Institutional

9. This dimension has to do with the institutional arrangements necessary to achieve real integration, in accordance with the orientation of the two compatible policies, namely, statistics and geospatial information. It begins on a national scale and entails the interaction between the geospatial information and the statistics communities and their leadership, but also the involvement of the institutional stakeholders from the other sectors of the national economy. The same inclusive approach to agreeing on sustainable institutional arrangements applies to the regional economic community and Africa levels.

D. Modelling

10. The modelling dimension is the component of the integration process dealing with the technical, technological and scientific abstraction and their related functional and procedural interaction. The Expert Group on the Integration of Statistical and Geospatial Information has already developed a global statistical geospatial framework that responds to the modelling dimension of the integration. The national model that can be derived from this framework will be a national statistical spatial framework adapted to each country's local conditions.

11. These four dimensions will generate a new field in the national landscape, with implications for the financial and human resources of the member State under consideration, the regional economic community and Africa as a whole.

IV. Benefits of the integration

12. Maps have often been used to provide the basic framework for supporting census logistics, designing, maintaining and manipulating census and survey geography, monitoring census activities, the processing of the raw data and the dissemination of census data. In addition, geographic information systems (GIS) are being widely used in the dissemination of statistics, given that they enable users to visualize complex social indicators in a form of a map

and provide various “What if” planning scenarios that result in quantitative measures that help developers, planners and community groups to make informed decisions.

13. With significant advances in geospatial technology, it has become possible to retool cartographic methods and leverage the various stages of the statistics-producing process by optimizing data collection and data processing and analysis and by standardizing and integrating data from various sources. Introducing geospatial technologies to member States involved in census activities will enable them to contribute significant amounts of cartographic and thematic data to the spatial information infrastructure of their institutions.

14. The integration of statistical and geospatial information will benefit member States in the provision of services for the attainment of international and national agreed developmental goals. Geospatial information is a useful tool in many areas of statistics, including population census, social and demographic statistics (i.e., health, justice, education and labour), economic statistics (e.g., business surveys, trade, transport, tourism and agriculture) and environment statistics. Geospatial information applies in the various phases of statistics production, and it is useful in cross-sectorial and inter-agency projects. The value of geospatial data in statistics is not surprising, given that most data types (variables) studied by statisticians have a spatial component. Everything and everyone is somewhere, and statisticians are uniquely aware of how boundary conditions can affect sampling and, consequently, their results.

V. Ascertaining the stage of the integration

15. The associated challenges in implementing the integration of geospatial and statistics is to ascertain the stage of the integration in African countries. At the Expert Group on the Integration of Statistical and Geospatial Information meeting held in Grand Bassam in November and December 2016, a draft questionnaire was discussed as a way to consult with countries on the continent and to solicit information on their achievements, plans, practices and preferences with respect to the integration of geospatial and statistical information. The next steps were to finalize the questionnaire, send it to countries and have them report back at the next meeting of the Regional Committee of the United Nations Global Geospatial Information Management for Africa.

16. Below are some of the findings resulting from the survey (see annex for the questionnaire), especially on the status of the preparedness of African countries for the mainstreaming of the enabling capabilities of geospatial technology into the activities of national statistics offices, including through training, data and processes.

VI. Conclusion

17. Considering the pervasiveness of geoinformation in modern society, the African Centre for Statistics is also engaged in leveraging the enabling capabilities of geospatial information technologies in statistics data collection, processing, analysis and dissemination, while ensuring that spatial information infrastructure is harmonized with national statistics development strategies.

18. With the advances in geospatial technology, it has become possible to retool cartographic methods and influence the various stages of the statistical process through optimizing data collection, data processing and analysis, and by standardizing and integrating data from various sources.

19. Mainstreaming geospatial technologies into national statistics office activities (e.g., census logistics, designing, planning and monitoring) will

enable them to contribute significant amounts of spatial, thematic and socioeconomic data in support of evidence-based policy analysis and the locational management of information. In keeping with global trends of bringing geography and statistics together, the African Centre for Statistics would like to commence the dialogue necessary and develop the capacity of member States in order to ensure that national statistics, planning and cartographic authorities have effective collaboration between them in the development of their data infrastructure and systems.

Annex I

Regional Committee of United Nations Global Geospatial Information Management for Africa working group 5

QUESTIONNAIRE

Consultation on geocoding practices, linking and integration practices and geographic classification practices

[Consultations sur les pratiques de géocodage, liaisons, intégration et les classifications géographiques].

Please provide your contact details [Veuillez Fournir vos contacts]:				
Country/Pays:				
Name/Nom:				
Organisation:				
Email address/Courriel:				

		MAIN **[Principal]**		**OTHER** **Autre**
What geospatial information do you attach to your unit record data? **Quelle information spatiale attachez-vous à vos données d'enregistrement**		Please tick one [Cochez un svp]		Tick all used [Cochez toutes les utilisations]
Administrative Geography - regional government (sub national eg. state, province) Géographie administrative – Gouvernement régional (sous-national, p.ex. État, Province)				
Administrative Geography - service delivery (e.g. Hospital regions, school zones, etc) Géographie administrative – Fourniture de Services (p.ex. district sanitaire, zones scolaires, etc.)				
Administrative Geography - postal Géographie administrative – Postes				
Statistical Geography - population based Géographie Statistique – Basée sur la population				
Statistical Geography - socioeconomic Géographie Statistique - Socio-economique				
Statistical Geography - functional (eg. rural/urban, remoteness, etc.) Géographie statistique (p.ex rurale / urbaine, éloignement, etc.)				
Grid (Raster) Cells Grille (Raster) de mailles				
Electoral Geography Géographie Electorale				
Environmental Geography Géographie Environnementale				
Enumeration / Census Geography Géographie Censitaire / Énumération				
Other (give details) Autre (Donner les details)				

		MAIN		OTHER
What approach do you use to geocode your unit record data? Quelle approche utilisez-vous pour géocoder votre unité de donnée d'enregistrement		Please tick one		Tick all used
Direct capture in the field (e.g. GPS) Capture direct sur le terrain (ex. GPS)				
Address Geocoding (matching reported address to an address index) Géocodage des adresse (concordance des adresses reportées avec un registre d'adresses)				
National Register - widely used Address/Building/Property Register (matching records to a register using a unique identifier) Registre national – Registre communément utilisé pour les adresses/Bâtis/Propriétés (concordance des enregistrements avec un registre d'identifiants uniques)				
Block/Locality/Community (coding a respondent to a small geographic region) Bloc/Localité/Communauté (codage d'un répondant à une petite région géographique)				
Region (coding a respondent to a larger geographic region e.g. town) Région (codage d'un répondant à une grande région géographique, p.ex. une ville)				
Enumeration Geography (geography based on an enumeration area, e.g. Census tract) Enumération géographique (géographie basée sur une région d'énumération, p.ex. un transept censitaire)				
Reported area - postal (respondent reported postal area) Zone de report - Poste (répondant relia à une zone postale)				
Reported area - other (respondent reported geography e.g. administrative geography) Zone de report – Autres (répondant lié à une entité géographique, p.ex. la géographie administrative)				
Other (give details) Autres (Donnez les details)				

Please forward to: Nonguierma@un.org

Annex II

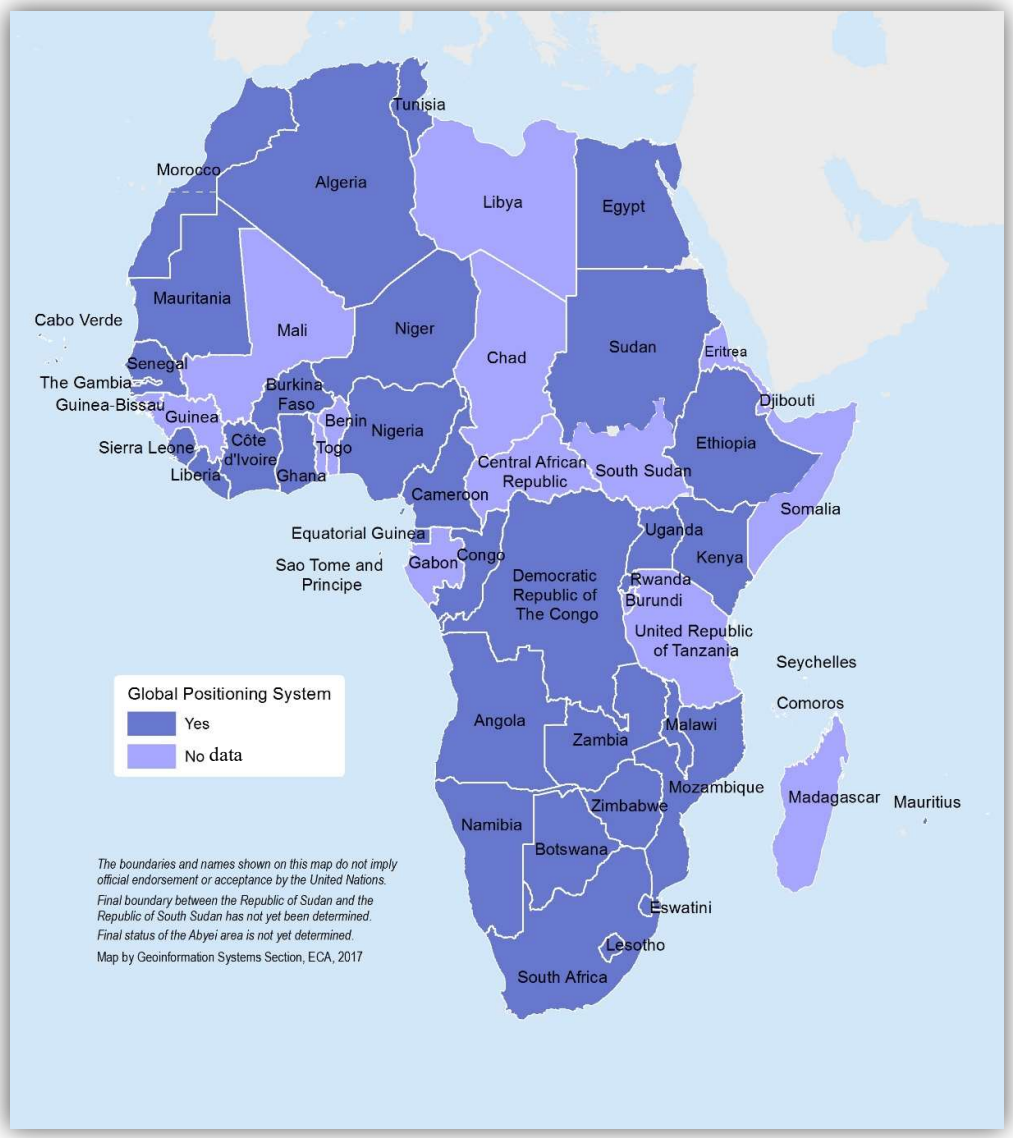
Geographic information systems in census taking

One of the distinguishing features of censuses of population and housing is the extent to which a comprehensive classification of geographic characteristics can be undertaken. Once the population base has been determined, it is possible to examine how this population is geographically located. GIS plays a fundamental role in the creation of enumeration area maps for a seamless collection of census data. Presently, 67 per cent of countries are in various stages of developing the official census documents (see map 1).

Map 1
Use of geographic information systems in census taking in Africa

Global Positioning System (GPS) devices assist in determining the current ground position of an object on Earth. The place of usual residence can be georeferenced to a pair of precise geographical coordinates and linked to an address point or, in the absence of such coordinates, to a precise and complete postal address for geocoding purposes. The link between the census information and the location of the place of usual residence should form a permanent and integrated part of the census information at the individual record level. The purpose is to enable tabulations and spatial aggregations to be referenced to any small geographic or administrative subdivisions and, if possible, population grids. Presently, 67 per cent of countries are at various stages of using GPS devices for the census (see map 2).

Map 2
Use of Global Positioning Systems in census taking in Africa



Use of aerial photography in census taking

Aerial photography is obtained using specialized cameras on low-flying planes. The photos can be combined to produce a seamless mosaic image covering very large parts of a territory that can be used for census cartography and other

analytical processes. Presently, 37 per cent of countries are at various stages of using aerial photography in census taking (see map 3).

Map 3
Use of aerial photography in census taking in Africa

Use of Global Positioning Systems in census taking

Satellite imagery consists of images of Earth or other planets collected by satellites. The spatial resolution of a satellite image is measured by the size of a pixel on the ground, which varies from the less than 1 m of the most popular high-resolution systems to 100 m for low-resolution systems. For most census applications, 5 m or better spatial resolution is needed to identify housing units. Landsat satellite imagery may be considered in some cases only in rural areas. Online remotely sensed data such as Google Earth, GlobeXplorer, ArcGIS Explorer and Microsoft Virtual Earth can be used as a first test, but the image quality may not be suitable for detailed enumeration areas mapping. Presently, some 65 per cent of countries are at various stages of using satellite imagery in census taking (see map 4).

Map 4
Use of satellite imagery in census taking in Africa

Use of satellite imagery in census taking